US EPA Mid-Continent Ecology Division

Research Project Summary

Habitat - Biota Relationships in Great Lakes Coastal Wetlands

Overview

EPA's National Health and Environmental Effects Research Laboratory (NHEERL) has committed to a research program to provide the science needed to develop habitat-based criteria for protection of coastal ecosystems. As part of this effort, the Mid-Continent Ecology Division (MED) is studying relationships between fishes and habitat composition in coastal wetlands of the Great Lakes. Most Great Lakes fishes depend directly or indirectly on wetlands (Fig. 1), and habitat alteration is an important threat. MED's research will provide the scientific basis for habitat criteria by determining which biological and habitat endpoints to measure, and establishing relationships between them that consider both natural and human drivers of wetland condition. The research is integrated with MED nutrient research on these same wetlands, and is coordinated with EPA-funded university research on Great Lakes wetlands and nearshore areas (see Internet link).

So far, we have sampled 24 coastal wetlands each in the years 2002 and 2003. Wetlands were distributed across the five lakes and the upper and lower "ecoprovince" (Fig. 2) so that the influence of climate, geology, and species distributions on wetland characteristics can be determined. An equal number of "riverine" and "protected" type wetlands (Fig. 3) were sampled, so that the influence of streamflow and connectivity to the watershed (with implications for flood-scouring, water residence times, nutrient and sediment loading) can be determined. Within combinations of ecoprovince and wetland type, wetlands were selected to span a gradient in nutrient loading. Nutrient loading is a major stressor, directly impacting water clarity and quality, which in turn affect aquatic plant composition and cover -- the primary habitat for wetland fishes.

Our sampling protocol includes characterizing fish assemblages and their association with habitat elements (water depth, cover, and composition of aquatic vegetation) across each wetland, collecting sediment and water samples, and recording information on wetland setting such as tributary inputs, human impacts, and surrounding landcover and landuse (Fig. 4). The field effort represents a full day of work at each wetland for a five-person crew, and also generates a number of sediment and water samples for later laboratory analysis. Characteristics of the watersheds in which the wetlands are situated (such as size, slope, population and road density, and agriculture) are being obtained via computer techniques (geographic information system analyses). Once the data is in hand, statistical analyses will identify those habitat measures that relate to various aspects of the fish assemblage, and identify natural classification factors and human impacts that organize habitat patterns. Outputs from our research will include recommendations for metrics suited to establishing fish-habitat relationships, identification of wetland classes for which those relationships are applicable, and quantified information on the nature of the fish and habitat responses across impact gradients.


Emergent, floating-leaved, and
submerged vegetation zones
provide habitat for fish in a
Great Lakes coastal wetland

Figure 1

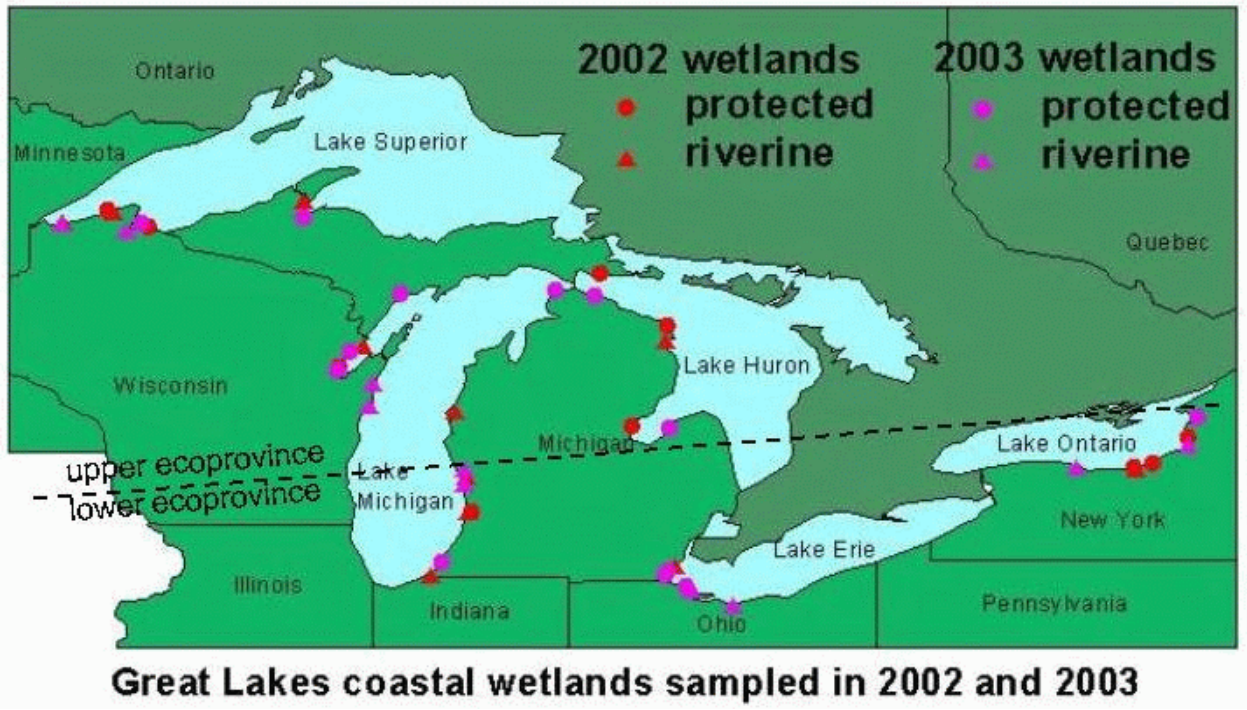
2002 wetlands
protected
riverine
2003 wetlands
protected
riverine
Ontario
Minnesota
Lake Superior
Quebec
Wisconsin
Lake Huron
Michigan
Lake Ontario
upper ecoprovince
lower ecoprovince
Lake Michigan
New York
Lake Erie
Illinois
Indiana
Ohio
Pennsylvania
Great Lakes coastal wetlands sampled in 2002 and 2003

Figure 2

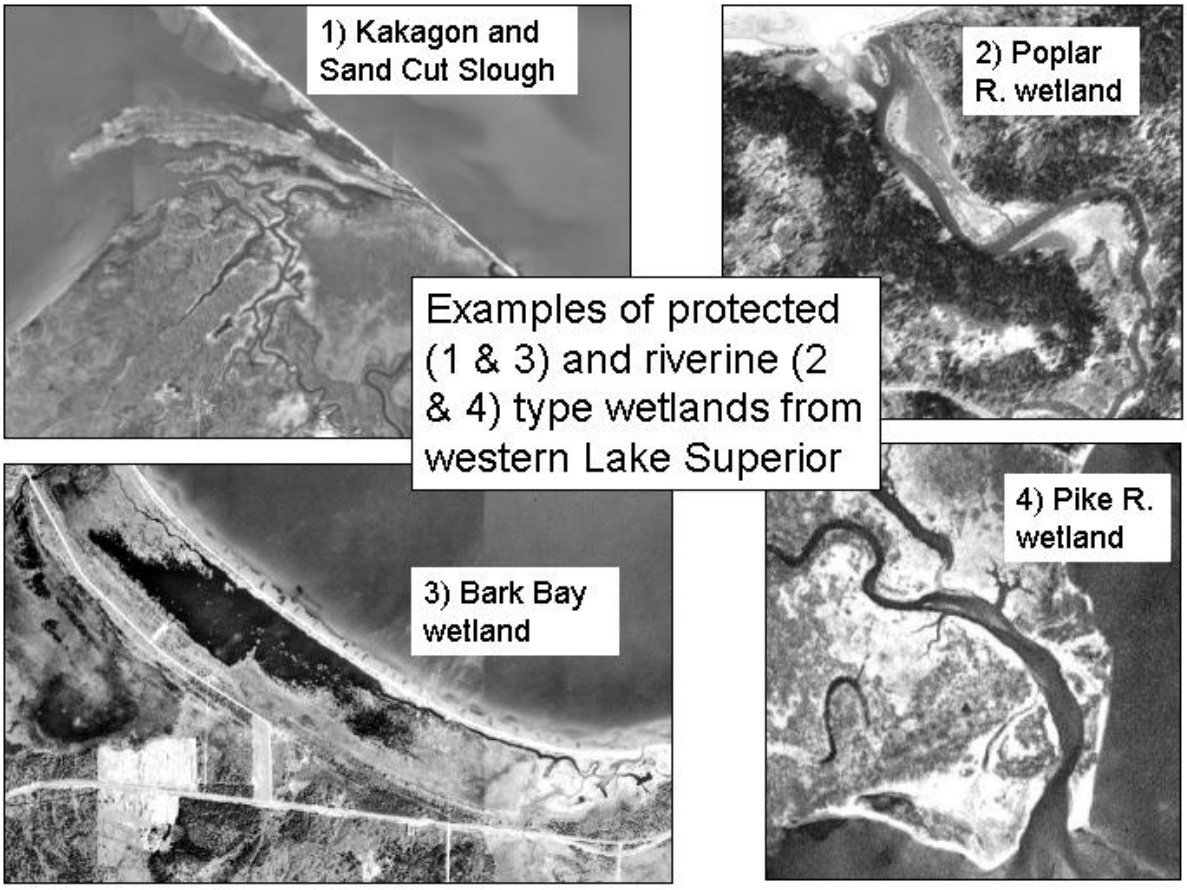
1) Kakagon and Sand Cut Slough
2) Poplar R. wetland
Examples of protected (1 & 3) and riverine (2 & 4) type wetlands from western Lake Superior
3) Bark Bay wetland
4) Pike R. wetland

Figure 3


(3)
(6)
(2)
(1)
Field work includes characterizing plants (1), invertebrates (2), fish (3), water clarity (4), water chemical constituents (5), and hydrology (6).
(4)
(5)

Figure 4

Key Products

Our research objectives/approaches and initial results were presented at the 2003 meetings of the International Association for Great Lakes Research, and the Society for Conservation Biology.

Future product: description of biotic assemblages and habitat composition and condition for suite of wetlands representing the range of natural conditions and human impacts across the Great Lakes.

Future product: develop wetland classification schemes based on biogeography and hydrogeomorphology to support comparability of habitat and biotic conditions across sites.

Future product: develop quantified relationships among biota and habitat within wetland classes to predict biotic responses to anthropogenic changes in habitat composition and condition.

Internet home page of collaborators at UMD's Natural Resources Research Institute:
http://glei.nrri.umn.edu/

For further information on this research contact:

Anett Trebitz / John Brazner / Danny Tanner
trebitz.anett@epa.gov / **brazner.john@epa.gov** / **tanner.danny@epa.gov**
218-529-5209 / 218-529-5207 / 218-529-5208